WHAT IS CLAIMED IS:

1. A photoelectric conversion device comprising:

a substrate having a main surface;

a first conductivity type first non-single-crystalline semiconductor layer formed on said main surface of said substrate;

a second conductivity type second non-single-crystalline semiconductor layer formed on said main surface of said substrate; and

a substantially intrinsic third non-single-crystalline semiconductor layer formed between said first non-single-crystalline semiconductor layer and said second non-single-crystalline semiconductor layer, wherein

many of crystal grains contained in said third non-single-crystalline semiconductor layer have major axes substantially perpendicular to said main surface of said substrate on an interfacial portion between at least either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer, and

many of crystal grains contained in said either semiconductor layer have major axes substantially parallel to said main surface of said substrate on said interfacial portion.

2. The photoelectric conversion device according to claim 1, wherein

the average grain size of said crystal grains contained in said either semiconductor layer in the direction parallel to said main surface of said substrate is larger than the average grain size of said crystal grains contained in said third non-single-crystalline semiconductor layer in the direction parallel to said main surface of said substrate.

3. The photoelectric conversion device according to claim 1, wherein

said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor layer consist of microcrystalline semiconductor layers.

4. The photoelectric conversion device according to claim 3, wherein

said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor layer consist of microcrystalline silicon layers.

5. The photoelectric conversion device according to claim 1, further comprising an electrode layer formed between said substrate and either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer to come into contact with either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer, wherein

many of crystal grains contained in said electrode layer have major axes substantially perpendicular to said main surface of said substrate.

6. The photoelectric conversion device according to claim 5, wherein

said electrode layer is a transparent electrode layer.

7. The photoelectric conversion device according to claim 6, wherein

said transparent electrode layer consists of AZO.

8. The photoelectric conversion device according to claim 1, including at least one power generation unit having said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor

layer.

9. A photoelectric conversion device comprising:

a substrate having a main surface;

a first conductivity type first non-single-crystalline semiconductor layer formed on said main surface of said substrate;

a second conductivity type second non-single-crystalline semiconductor layer formed on said main surface of said substrate; and

a substantially intrinsic third non-single-crystalline semiconductor layer formed between said first non-single-crystalline semiconductor layer and said second non-single-crystalline semiconductor layer on said main surface of said substrate, wherein

at least either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer includes a structure formed by stacking a first layer and a second layer containing many crystal grains having major axis directions substantially different from each other,

many of crystal grains contained in said first layer have major axes substantially parallel to said main surface of said substrate, and

many of crystal grains contained in said second layer

have major axes substantially perpendicular to said main surface of said substrate.

10. The photoelectric conversion device according to claim 9, wherein

said first layer is in contact with said third non-single-crystalline semiconductor layer, and

many of crystal grains contained in said third non-single-crystalline semiconductor layer have major axes substantially perpendicular to said main surface of said substrate.

11. The photoelectric conversion device according to claim 9, wherein

said second layer is in contact with said third non-single-crystalline semiconductor layer.

12. The photoelectric conversion device according to claim 9, wherein

the average grain size of said crystal grains contained in said first layer in the direction parallel to said main surface of said substrate is larger than the average grain size of said crystal grains contained in said second layer in the direction parallel to said main surface of said substrate.

13. The photoelectric conversion device according to claim 9, wherein

said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor layer consist of microcrystalline semiconductor layers.

14. The photoelectric conversion device according to claim 13, wherein

said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor layer consist of microcrystalline silicon layers.

15. The photoelectric conversion device according to claim 9, further comprising an electrode layer formed between said substrate and either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer to come into contact with either said first non-single-crystalline semiconductor layer or said second non-single-crystalline semiconductor layer, wherein

many of crystal grains contained in said electrode layer have major axes substantially perpendicular to said

main surface of said substrate.

16. The photoelectric conversion device according to claim 15, wherein

said electrode layer is a transparent electrode layer.

17. The photoelectric conversion device according to claim 16, wherein

said transparent electrode layer consists of AZO.

18. The photoelectric conversion device according to claim 9, including at least one power generation unit having said first non-single-crystalline semiconductor layer, said second non-single-crystalline semiconductor layer and said third non-single-crystalline semiconductor layer.